

CLAIMS

I claim:

1. A method for removing material from a well bore extending from a ground surface into a hydrocarbon formation having a pressure, comprising the steps of:
 - (a) delivering into said well bore a concentric tubing string, said concentric tubing string comprising an inner tube means having an inner annulus therethrough and an outer tube means forming an outer annulus between said outer tube means and said inner tube means;
 - (b) introducing into said well bore a pressurized clean out medium through one of the said inner annulus and outer annulus; and
 - (c) removing said material and clean out medium through the other of the said inner annulus and said outer annulus to the surface of said well bore.
2. The method of claim 1 wherein said pressurized clean out medium is introduced into said well bore at a pressure substantially equal to or below said pressure of the formation.
3. The method of claim 1 wherein said concentric tubing string is a concentric coiled tubing string.
4. The method of claim 1 wherein said concentric tubing string is a concentric drill pipe string.
5. The method of claim 1 wherein said material comprises one or more of solid particles, sediment, injection fluids, fracturing acids, sands, and drilling fluids.

6. The method of claim 1 wherein said clean out medium is selected from the group consisting of drilling mud, drilling fluid, air, gas, acids and a mixture of drilling fluid and gas.
- 5 7. The method of claim 1, said concentric tubing string having a top and a bottom, wherein said pressurized clean out medium is introduced by a discharging means operably connected near the top of said concentric tubing string in communication with either said inner annulus or said outer annulus.
8. The method of claim 7 wherein said discharging means is a mud pump.
- 10 9. The method of claim 7 wherein said discharging means is a discharging compressor.
10. The method of claim 1, said concentric tubing string having a top and a bottom, wherein said material and said clean out medium is removed by a suctioning means operably connected near the top of said concentric tubing string in communication with either said inner annulus or said outer annulus.
- 15 11. The method of claim 10 wherein said suctioning means is a suction compressor.
12. The method of claim 1, said concentric tubing string having a top and a bottom, further comprising the step of providing a downhole flow control means at or near the bottom of said concentric tubing string for preventing
20 flow of hydrocarbon from the inner annulus, the outer annulus or both to the surface of the well bore.
13. The method of claim 12 further comprising the step of controlling said downhole flow control means at the surface of said well bore by a surface control means.
- 25 14. The method of claim 13 wherein said step of controlling said downhole flow control means further comprises surface control means transmitting a signal

selected from the group consisting of an electric signal, a hydraulic signal, a pneumatic signal, a light signal or a radio signal.

15. The method of claim 1, said concentric tubing string having a top and a bottom, further comprising the step of providing a clean out tool at or near the bottom of said concentric tubing string for disturbing said material in said well bore.
16. The method of claim 14 wherein said clean out tool is a reciprocating clean out tool.
17. The method of claim 16 wherein said clean out tool further comprises a clean out means having a plurality of teeth and a reciprocating piston.
18. The method of claim 1 wherein said pressurized clean out medium is introduced into said well bore through the outer annulus and said material and said clean out medium is removed through the inner annulus.
19. The method of claim 1 wherein said pressurized clean out medium is introduced into said well bore through the inner annulus and said material and said clean out medium is removed through the outer annulus.
20. The method of claim 1 further comprising the step of providing a surface flow control means positioned at or near the surface of the well bore for preventing flow of hydrocarbon from a space between an outside wall of said outer tube means and a wall of said well bore.
21. The method of claim 10 wherein said suctioning means further comprises a flare means for flaring hydrocarbon produced from the well bore.
22. The method of claim 1, said concentric tubing string further comprising a venturi, said method further comprising the step of accelerating said exhaust clean out medium through said venturi so as to facilitate removal of said material to the surface of said well bore.

23. The method of claim 1 further comprising the step of providing a shroud means positioned in a space between an outside wall of said outer tube means and a wall of said well bore for preventing a release of clean out medium or material or both in said space.
- 5 24. The method of claim 1 further comprising the step of providing a shroud means positioned in a space between an outside wall of said outer tube means and a wall of said well bore for preventing a release of clean out medium or material or both into said hydrocarbon formation.
25. The method of claim 1 wherein said well bore further comprises a casing means having a plurality of perforations.
- 10 26. An apparatus for removing material from a well bore extending from a ground surface into a hydrocarbon formation having a pressure, comprising:
- 15 (a) a concentric tubing string, said concentric tubing string comprising an inner tube means having an inner annulus therethrough and an outer tube means forming an outer annulus between said outer tube means and said inner tube means;
- (b) means for introducing into said well bore a pressurized clean out medium through one of the said inner annulus and outer annulus; and
- 20 (c) means for removing said material and clean out medium through the other of the said inner annulus and said outer annulus to the surface of said well bore.
27. The apparatus of claim 26 wherein said concentric tubing string is a concentric drill pipe string.
- 25 28. The apparatus of claim 26 wherein said concentric tubing string is a concentric coiled tubing string.

29. The apparatus of claim 26, said concentric tubing string having a top and a bottom, wherein said introducing means is operably connected near the top of said concentric tubing string in communication with either said inner annulus or said outer annulus.
- 5 30. The apparatus of claim 26 wherein said introducing means is a mud pump.
31. The apparatus of claim 26 wherein said introducing means is a discharging compressor.
32. The apparatus of claim 26, said concentric tubing string having a top and a bottom, wherein said removing means is operably connected near the top of said concentric tubing string in communication with either said inner annulus or said outer annulus.
- 10 33. The apparatus of claim 32 wherein said removing means is a suctioning compressor.
34. The apparatus of claim 26, said concentric tubing string having a top and a bottom, further comprising a downhole flow control means at or near the bottom of said concentric tubing string for preventing flow of hydrocarbon from the inner annulus, the outer annulus or both to the surface of the well bore.
- 15 35. The apparatus of claim 34 further comprising a surface control means for controlling said downhole flow control means at the surface of said well bore.
- 20 36. The apparatus of claim 35 wherein said surface control means transmits a signal selected from the group consisting of an electric signal, a hydraulic signal, a pneumatic signal, a light signal or a radio signal.
37. The apparatus of claim 26, said concentric tubing string having a top and a bottom, further comprising a clean out tool at or near the bottom of said concentric tubing string for disturbing said material in said well bore.
- 25 38. The apparatus of claim 37 wherein said clean out tool is a reciprocating clean out tool.

39. The apparatus of claim 38 wherein said clean out tool further comprises a clean out means having a plurality of teeth and a reciprocating piston.
40. The apparatus of claim 37 wherein said clean out tool further comprises a diverter means to facilitate removal of clean out medium from the concentric tubing string.
41. The apparatus of claim 40 wherein said diverter means comprises a venturi.
42. The apparatus of claim 26 further comprising a surface flow control means positioned at or near the surface of the well bore for preventing flow of hydrocarbon from a space between an outside wall of said outer tube means and a wall of said well bore.
43. The apparatus of claim 29 wherein said removing means further comprises a flare means for flaring hydrocarbon produced from the well bore.
44. The apparatus of claim 26 further comprising a shroud means positioned in a space between an outside wall of said outer tube means and a wall of said well bore for preventing a release of clean out medium or material or both in said space and into said hydrocarbon formation.
45. The apparatus of claim 28 further comprising a bottom hole assembly.
46. The apparatus of claim 28 wherein said bottom hole assembly comprises a reciprocating clean out tool.
47. The apparatus of claim 46 wherein said bottom hole assembly further comprises a rotation means attached to said reciprocating clean out tool.
48. The apparatus of claim 47 further comprising a connecting means for connecting said outer tube means and said inner tube means to said reciprocating clean out tool thereby centering said inner tube means within said outer tube means.

49. The apparatus of claim 48 further comprising a disconnecting means located between said connecting means and said reciprocating clean out tool for disconnecting said reciprocating clean out tool from said concentric coiled tubing string.
- 5 50. The apparatus of claim 28 further comprising means for storing said concentric coiled tubing string.
51. The apparatus of claim 50 wherein said storing means comprises a work reel.
52. A method for removing material from a well bore extending from a ground surface into a hydrocarbon formation having a pressure, comprising the steps of:
- 10 of:
- (a) delivering into said well bore a production tubing string, said production tubing string having an inner annulus therethrough and forming an outer annulus between an outer wall of said production tubing string and a wall of said well bore;
 - 15 (b) introducing into said well bore a pressurized clean out medium through one of the said inner annulus and outer annulus; and
 - (c) removing said material and clean out medium through the other of the said inner annulus and said outer annulus to the surface of said well bore.
- 20 53. The method of claim 52 wherein said wall of said well bore further comprises a casing having a plurality of perforations.
54. The method of claim 52 wherein said pressurized clean out medium is introduced into said well bore at a pressure substantially equal to or below said pressure of the formation.
- 25 55. The method of claim 52 wherein said production tubing string is a coiled tubing string.

56. The method of claim 52 wherein said production tubing string is a drill pipe string.
57. The method of claim 52 wherein said material comprises one or more of solid particles, sediment, injection fluids, fracturing acids, sands, and drilling fluids.
- 5 58. The method of claim 52 wherein said clean out medium is selected from the group consisting of drilling mud, drilling fluid, air, gas, acids and a mixture of drilling fluid and gas.
- 10 59. The method of claim 52, said production tubing string having a top and a bottom, wherein said pressurized clean out medium is introduced by a discharging means operably connected near the top of said production tubing string in communication with said inner annulus or operably connected to said outer annulus formed between said outer wall of said production tubing string and said wall of said well bore.
- 15 60. The method of claim 59 wherein said well bore further comprises a casing having a plurality of perforations.
61. The method of claim 52 wherein said discharging means is a mud pump.
62. The method of claim 52 wherein said discharging means is a discharging compressor.
- 20 63. The method of claim 1, said production tubing string having a top and a bottom, wherein said material and said clean out medium is removed by a suctioning means operably connected near the top of said production tubing string in communication with said inner annulus or operably connected to said outer annulus formed between said outer wall of said production tubing string and said wall of said well bore.
- 25 64. The method of claim 63 wherein said suctioning means is a suction compressor.

65. The method of claim 52, said production tubing string having a top and a bottom, further comprising the step of providing a downhole flow control means at or near the bottom of said production tubing string for preventing flow of hydrocarbon from the inner annulus to the surface of the well bore.
- 5 66. The method of claim 65 further comprising the step of controlling said downhole flow control means at the surface of said well bore by a surface control means.
67. The method of claim 66 wherein said step of controlling said downhole flow control means further comprises surface control means transmitting a signal selected from the group consisting of an electric signal, a hydraulic signal, a pneumatic signal, a light signal or a radio signal.
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68. The method of claim 52, said production tubing string having a top and a bottom, further comprising the step of providing a clean out tool at or near the bottom of said production tubing string for disturbing said material in said well bore.
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69. The method of claim 68 wherein said clean out tool is a reciprocating clean out tool.
70. The method of claim 69 wherein said clean out tool further comprises a clean out means having a plurality of teeth and a reciprocating piston.
- 20 71. The method of claim 52 wherein said pressurized clean out medium is introduced into said well bore through the outer annulus and said material and said clean out medium is removed through the inner annulus.
72. The method of claim 52 wherein said pressurized clean out medium is introduced into said well bore through the inner annulus and said material and said clean out medium is removed through the outer annulus.
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73. The method of claim 52 further comprising the step of providing a surface flow control means positioned at or near the surface of the well bore for preventing

flow of hydrocarbon from a space between an outside wall of said production tubing string and a wall of said well bore.

74. The method of claim 63 wherein said suctioning means further comprises a flare means for flaring hydrocarbon produced from the well bore.

5 75. An apparatus for removing material from a well bore extending from a ground surface into a hydrocarbon formation having a pressure, comprising:

10 (a) a production tubing string, said production tubing string having an inner annulus therethrough and forming an outer annulus between an outer wall of said production tubing string and a wall of said well bore;

(b) means for introducing into said well bore a pressurized clean out medium through one of the said inner annulus and outer annulus; and

15 (c) means for removing said material and clean out medium through the other of the said inner annulus and said outer annulus to the surface of said well bore.

76. The apparatus of claim 75 wherein said production tubing string is a drill pipe string.

20 77. The apparatus of claim 75 wherein said concentric tubing string is a coiled tubing string.

78. The apparatus of claim 75, said production tubing string having a top and a bottom, wherein said introducing means is operably connected near the top of said production tubing string in communication with said inner annulus or operably connected to said outer annulus formed between said outer wall of said production tubing string and said wall of said well bore.

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79. The apparatus of claim 75 wherein said introducing means is a mud pump.

80. The apparatus of claim 75 wherein said introducing means is a discharging compressor.
81. The apparatus of claim 75, said production tubing string having a top and a bottom, wherein said removing means is operably connected near the top of said production tubing string in communication with said inner annulus or operably connected to said outer annulus formed between said outer wall of said production tubing string and said wall of said well bore.
82. The apparatus of claim 81 wherein said removing means is a suctioning compressor.
83. The apparatus of claim 75, said production tubing string having a top and a bottom, further comprising a downhole flow control means at or near the bottom of said production tubing string for preventing flow of hydrocarbon from the inner annulus to the surface of the well bore.
84. The apparatus of claim 83 further comprising a surface control means for controlling said downhole flow control means at the surface of said well bore.
85. The apparatus of claim 84 wherein said surface control means transmits a signal selected from the group consisting of an electric signal, a hydraulic signal, a pneumatic signal, a light signal or a radio signal.
86. The apparatus of claim 75, said production tubing string having a top and a bottom, further comprising a clean out tool at or near the bottom of said production tubing string for disturbing said material in said well bore.
87. The apparatus of claim 86 wherein said clean out tool is a reciprocating clean out tool.
88. The apparatus of claim 87 wherein said clean out tool further comprises a clean out means having a plurality of teeth and a reciprocating piston.

89. The apparatus of claim 75 further comprising a surface flow control means positioned at or near the surface of the well bore for preventing flow of hydrocarbon from the outer annulus.
- 5 90. The apparatus of claim 81 wherein said removing means further comprises a flare means for flaring hydrocarbon produced from the well bore.
91. The apparatus of claim 77 further comprising a bottom hole assembly.
92. The apparatus of claim 91 wherein said bottom hole assembly comprises a reciprocating clean out tool.
- 10 93. The apparatus of claim 92 wherein said bottom hole assembly further comprises a rotation means attached to said reciprocating clean out tool.
94. The apparatus of claim 93 further comprising a connecting means for connecting said coiled tubing string to said reciprocating clean out tool.
- 15 95. The apparatus of claim 94 further comprising a disconnecting means located between said connecting means and said reciprocating clean out tool for disconnecting said reciprocating clean out tool from said concentric coiled tubing string.
96. The apparatus of claim 77 further comprising means for storing said concentric coiled tubing string.
97. The apparatus of claim 96 wherein said storing means comprises a work reel.

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